UDOT RESEARCH & DEVELOPMENT REPORT ABSTRACT

1. Report No. UT - 99.15.	**2. Government Accession No.**	**3. Recipients Catalog No.**
4. Title and Subtitle Forced Vibration Testing of the I-15 South Temple Bridge	**5. Report Date** December 1999 **6. Performing Organization Code**	
7. Author(s) Womack, Kevin C., Ph.D., P.E. Halling, Marvin W., Ph.D., P.E.	**8. Performing Organization Report No.**	
9. Performing Organization Name and Address Utah State University Department of Civil and Environmental Engineering Logan, UT 84322	**10. Work Unit No.** **11. Contract No.** 99-9085	
12. Sponsoring Agency Name and Address Utah Department of Transportation 4501 South 2700 West Salt Lake City, UT 84119-5998	**13. Type of Report and Period Covered** Phase 1Final Report October 1998 to December 1999 **14. Sponsoring Agency Code**	

15. Supplementary Notes

Paul A. Mooney, FHWA, Utah Division, Marketing and Technology Implementation Specialist
William R Gedris, FHWA, Utah Division, Structural/Environmental Engineer
Samuel E. Sherman, UDOT Research Division, Project Manager

16. Abstract

The objective of this research program is to investigate the potential for using system identification as a non-destructive evaluation technique. This research examines the feasibility of performing system identification on a large, multi-degree of freedom structure and a simple, single span structure. The testing consisted of performing sine sweeps over a range of excitation frequencies, with the excitation induced in the horizontal direction by an eccentric mass shaker. The response of the two bridge structures was recorded with accelerometers. The simple span structure was tested in seven condition states that included post-damage testing.

In the case of the nine-span bridge the lowest five response modes and frequencies were determined, demonstrating that system identification of large bridge structures is possible. For the simple span structure the lowest three mode shapes and frequencies were determined for each condition state. The change in the natural frequencies for each condition state demonstrated the new condition of the bridge, whether it was post-damage or post-repair. This indicates that system identification (modal analysis) has potential as a non-destructive evaluation method for determining structural integrity.

17. Key Words System identification, modal analysis, natural frequencies, mode shapes, structural integrity, non-destructive evaluation, forced vibration..		**18. Distribution Statement** No Restrictions. Available from: UDOT Research Division, Box 148410, Salt Lake City, Utah 84114-8410 Utah State University Department of Civil and Environmental Engineering 4110 Old Main Hill Logan, Utah 84322-4110	
19. Security Classification (of this report) None	**20. Security Classification (of this page)** None	**21. No. of Pages** 34	**22. Price**